4. FIELD OBSERVATIONS ON THE CURLEW *NUMENIUS ARQUATA* WINTERING ON THE GULF OF KUTCH COAST[1]

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The Curlew *Numenius arquata* winters on the coast in the Gulf of Kachchh, Gujarat. It breeds in Central Asia; moves to south and south-east Asia during the non-breeding period. The Gulf of Kachchh coast is located at the north of the Saurashtra peninsula in the Jamnagar district of Gujarat, India. The Gulf is exceptionally rich in marine life, and a number of migratory bird species spend the winter here. The long coastline, with broad intertidal mudflats, coral reefs, sandy and rocky beaches offer great diversity of habitats for birds to utilize, and the area is very rich in the diversity and number of both migratory and resident birds. The birdlife of the area has been documented by Abdulali (1962, 1963), Himmatsinhji (1968), Parasharya (1984), Palmes and Briggs (1986), Naik *et al.* (1991), Mundkur (1991), Bhuva and Soni (1998), Soni and Bhuva (2007). The Curlew regularly visits the Gulf of Kachchh during the winter period and uses the coast for feeding and roosting only.

The Gulf of Kachchh, during the last two decades, has been a centre of attraction for several industrial giants, and a number of industries have been established there. Due to these developments, the area is bound to see increase in anthropogenic pressures and related changes.

The Gulf of Kachchh is spread in an area of approximately 7,350 sq. km and has a maximum depth of about 60 m (Hashmi *et al.* 1978); 457.92 sq. km area along the coast of Jamnagar has been notified as a Marine National Park and Sanctuary, and includes 42 islands. Coastal swamps, estuaries, coastal sands, coral reefs and mangrove forest all along the southern part of the Gulf provide foraging grounds to a variety of birds. The Gulf of Kachchh is elongated in east-west direction. At the entrance (63° 05' E) it is about 40 km wide, reduces to a width of 23 km at 69° 44' E, and thereafter slightly widens out before ending at 70° 20' E. The southern coastline of the Gulf of Kachchh is muddy with a few sandy and rocky patches. The vegetation is arid type, dominated by *Euphorbia*, *Acacia*, *Salvadora*, *Capparis* and *Prosopis*. The diversity of marine vegetation is quite poor, the mangrove area is stunted and dominated by *Avicennia marina*, though there is a rich diversity of marine algae (Naik *et al.* 1991).

The study was carried out at Narara Island and Rozybundar. Narara Island is located north of Vadinar town. It is a very small island (22° 25.8' - 22° 28.3' N; 60° 42.1' - 69° 44.7' E), 60 km west from Jamnagar. Length of the island is 0.5 km and width 40 to 50 m during high tide. During low tide, the intertidal area gets exposed up to 2 km. The intertidal area presents mangrove forest, sandy beach, rocky and sandy habitats, and coral reef. Intertidal area of Narara Island is very rich in marine flora and fauna.

Rozybundar (22° 35.6' - 22° 31.7' N; 70° 01.4' - 70° 04.0' E) is situated 10 km north-west to Jamnagar. Kamdar Salt and Chemical Works are situated above the high tide mark. West of the salt-pans is the new port of Jamnagar, to the east of the salt-pans is a privately owned scrub forest, and further east along the coast, are salt-pans of three companies separated from each other on the seaward side by mangrove fringed tidal channels.

The period between November to February shows most of the wintering Curlews on the Gulf coast (Bhuva 1999). The census was carried out from November, 1991 to February, 1992 and from November, 1993 to February, 1994). Data on foraging of the Curlew was collected from January 5, 1993 to February 25, 1993 and December 21, 1993 to February 28, 1994 both at the Narara Island and Rozybunder. Observations were made on adults during day using a telescope and a pair of binoculars from a reasonable distance for a period of 5 min, and effort was made to cover different foraging individuals, through focal sampling, in various parts of the intertidal zone. For rest of the method Soni and Bhuva (2007) was followed.

Roosting

At the time of high tide, all the curlews roosted together either along the coast or islands, or on mudflat of the intertidal zone; they roosted on the eastern and northern side of the Narara Island and the northern coast of the Rozybunder. The average population of Curlews on Narara island was about ten times higher than that of Rozybundar. The highest number of Curlews recorded at Narara Island in January was 209, but only 16 at Rozybundar in December-January. Whimbrel *Numenius phaeopus*, the Caspian Tern *Hydroprogne caspia*, the Bar-tailed Godwit *Limosa lapponica*, the Herring Gull *Larus argentatus*, the Lesser Black-backed Gull *Larus fuscus* and the Crab-plover *Dromas ardeola* were the other species observed roosting at the Narara island.

A selection of the high tide roost was affected by factors such as timings and level of tidal cycle, proximity and availability of a suitable roost and the level of anthropogenic disturbance. The comfortable roosts of neap tides often remained submerged during the high spring tides, and birds roosted on the coast of islands. The activities of fishermen and other people along the coast made it difficult for the Curlew and other waders to use many alternate suitable sites for roosting.

Foraging dispersion

Most of the birds, about 98%, were seen feeding on the mud flat area of the eastern side of Narara Island and northern side of Rozybunder; and some birds in the reef area. Just within 20-50 minutes after the tide started receding, the Curlew got scattered on mud flat and reef for feeding, and foraged actively throughout the period of low tide. At the time the tide started receding, the available foraging area was smaller, the birds usually started feeding much closer (about 2-10 m apart) along the waters' edge. A few individuals spread out over the available mudflat of the upper intertidal zone and fed solitarily. No sooner the available area of the intertidal zone increased with the receding tide then the distance between the birds increased (about 40-70 m). After constant feeding for about 4-5 hours, they slowly clumped, bathed, preened and rested for an 0.5-1 hour before moving to roost.

Foraging and food

The Curlew foraged by both the non-visual and visual tactile foraging methods applying shallow and deep probing. The Curlew preyed upon exposed as well as hiding prey inside its hole. When the Curlew picked up a crab while foraging at mud flats, it washed the mud-covered prey before eating it.

The Curlew used both the feeding modes: walking slowly when searching for hidden prey, and walking quickly when the bird saw some movement on the mud surface.

The number of feeding attempts recorded on foraging was 1,938 which were differentiated into successful and unsuccessful feeding attempts (Table 1). The prey species obtained and identified in the laboratory from 25 mud samples from the foraging sites were Fiddler Crabs (*Gelasimus annulipes*) and Rag-worms. It was difficult to collect regurgitated and faecal pellets as the location of the roost site of the Curlew was in 20-80 mm deep water. Out of 178 successful feeding attempts (Table 1), Rag-worms were identified in 14 attempts and Fiddler Crabs in 164 attempts. Unsuccessful feeding attempts were almost 10 times more than successful feeding attempts.

The Curlew affects harbours, backwaters, sandy seashores, tidal mudflats, creeks, estuaries, and mangrove swamps. The Curlew is a visual as well as tactile forager (Burton 1974) and feeds on a variety of macrobenthic species of prey from the intertidal mudflat. Its prey species include molluscs, seeds, crustacea (largely Fiddler and Sand Crabs), mudskippers, insects and occasionally berries and plant matter (Gooders 1979; Ali and Ripley 1983). Feeding mode in the Curlew varies with the prey availability such as 'Walking slowly' when searching for burrows entrances of benthic animals, and 'walking more quickly' when searching for surface feeding animals. The feeding behaviour and intake rate of the Curlew changed (Zwarts 1997). As per Zwarts and Wanink (1984), the Curlew ignores prey which is unprofitable, i.e., those of which the handling efficiency is below the intake rate during feeding. Caldow *et al.* (2003) mentioned that the Curlew increased in abundance at Mussel (*Mytilus edulis*) cultivation site on the intertidal flats. During the present study the main prey noticed was Fiddler Crabs.

An average number of successful feeding attempts of the Curlew were higher than those of Crab Plovers (Soni and Bhuva 2007). Possibly Curlew used 'Walk slowly' method which leads to a more successful feeding behaviour (Mundkur 1991) than walk-stop-look method used by Crab Plover. On the other hand a non-visual tactile foraging bird probes abruptly into the substrate which may result into either a successful or unsuccessful feeding attempt. However, the Curlew fed both by visual as well as tactile foraging.

Proportion of unsuccessful and successful feeding attempts of the Curlew was about 10:1 (Table 1). Among unsuccessful feeding attempts, a ratio of 'Deep' and 'Shallow Probing' was about 1:3 (Table 1).

Zwarts (1997) suggests that birds take different prey under different conditions and perhaps move away to better sites when the intake cannot meet with the output.

Table 1: Foraging activities of Curlew (*Numenius arquata*)

Foraging activities	Feeding attempts (n)	Attempts /min. mean ± SD
a) Successful feeding attempts	178	0.67 ± 0.37
b) Unsuccessful feeding attempts	1,760	6.74 ± 1.10
i) deep probing	451	1.73 ± 0.48
ii) shallow probing	1,309	5.01 ± 1.02
c) Total feeding attempts	1,938	7.42 ± 1.18

From direct observations on the prey of the Curlew when compared with the Crab Plover, the diversity of prey species of the Curlew was found to be less than that of the Crab Plover (Soni and Bhuva 2007); major (94%) being the Fiddler Crab. Thus, in the Gulf of Kachchh habitat Fiddler Crabs constitute important prey base for the Curlew.

The high tide roost sites are very crucial for the conservation of the Curlews and other waders. Since the Rozybunder faces heavy anthropogenic pressures, number of the Curlews on Rozybunder were extremely low. Thus, for the conservation of the Curlews and other waders it is very important to manage such sites to control the anthropogenic pressure. Otherwise, due to industrialization the pressure is going to increase day by day and the waders may face a variety of problems in the Gulf of Kachchh area.

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5. OCCURRENCE OF ORIENTAL SCOPS OWL *OTUS SUNIA SUNIA* IN MELGHAT TIGER RESERVE, MAHARASHTRA[1]

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I visited Raipur village, north-central part of Melghat Tiger Reserve, Maharashtra, in June 2004 for a status survey of the Forest Owlet (*Heteroglaux blewitti*). This area comes under Forest Division No. 1 of the Melghat Tiger Reserve. The terrain is undulating and hilly. The forest is dominated by Teak *Tectona grandis* in some patches, and mixed forest exists along the streams.

On June 05, 2004, while walking towards a waterhole in the Reserve I was informed by a tribal about a possible case of waterhole poisoning. Tribals in and around Melghat are known to poison waterholes for hunting wild animals. The waterhole was located in forest compartment No. 223, at 21° 34' N and 77° 17' E at an altitude of 550 m. At about 0900 hrs, I reached the waterhole and saw a bizarre sight;